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(54) **WIRELESS AUDIO TRANSMITTER FOR FM3 PLAYER**

Abstract

Disclosed herein is a wireless MP3 (MPEG 3 Layer: hereinafter, called "MP3") adapter, namely, a wireless audio transmitter of a portable MP3 player for wirelessly sending an audio signal outputted from the MP3 player to a car audio system and outputting the audio signal to the air through a speaker. The present invention includes a portable MP3 player, a wireless audio transmitter for frequency modulation and wireless transmission of an audio signal outputted from the MP3 player, an earphone jack for transmitting sound of the MP3 player, an earphone wire having an antenna needle therein for transmitting the audio signal outputted through the earphone jack to the wireless audio transmitter and sending an outputted high frequency signal to the air, an MP3 player holder mounted at a predetermined place inside a car for allowing the portable MP3 player to be easily mounted in the car, and a car audio system having a radio receiver, an antenna, a cassette player and a compact disk player (CDP) and installed at a predetermined place of the front surface inside the car.

Representative Drawing

FIG 3

Index

car audio, portable MP3 player, wireless adapter, FM high frequency converting device

SPECIFICATION

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a brief block diagram of a conventional car audio system.

FIG. 2 is a view showing the outward appearances of a wireless MP3 adapter having a wireless audio transmitter of an MP3 player according to the present invention and a car audio system.

FIG. 3 is a block diagram of the wireless audio transmitter of the MP3 player according to the present invention.

<Explanation on essential reference numerals in drawings>

200: wireless audio transmitter
201: MP3 player holder
202: earphone jack
204: earphone wire
210: FM converter
211: frequency selector
212: RF amplifier
214: band-pass filter
216: frequency counter
218: LCD driver
220: LCD device

DETAILED DESCRIPTION OF THE INVENTION

Purpose of the Invention

Field of the Invention and Description of the Related Art

The present invention relates to a wireless MP3 (MPEG 3 Layer: hereinafter, called "MP3") adapter, and more particularly, to a wireless audio transmitter for an MP3 player, which

frequency-modulates an audio signal outputted from the MP3 player, transmits the frequency modulated audio signal to a tuner through an antenna mounted on a car audio system, and audibly outputs the audio signal through a speaker to the air, thereby allowing a user to conveniently listen to high quality MP3 sound during driving.

In general, MP3 is one of various file storing methods for storing audio and image data, and an abbreviated word of "MPEG Player 3". MP3 is one of new digital audio file types appeared since "MPEG (Motion Picture Experts Group) Audio Layer_3" which means a motion picture compressing technology has been developed.

Since such MP3 type digital audio data shows a great compression rate, reduces a size of a file and is provided through PC communication network, anyone can easily download and store it into a compact audio storage card, so that the MP3 type digital audio data has been used widely.

Generally, an MP3 player is small-sized and portable, and so, a user can easily carry the MP3 player in his or her bag or pocket and listen to music stored in the MP3 player during the user's movement using a headphone or an earphone when the user wants to listen to music.

Such portable MP3 player has several problems in that other people who ride in the same car cannot listen to music through the MP3 player since the user has to use the headphone or earphone to listen to music playing from the MP3 player, and in that it may cause a traffic accident by obstructing driving.

To solve the above problems, Korean Utility Model Registration No. 20-0177691 discloses an MP3 player for vehicle. In Korean Utility Model Registration No. 20-0177691, the MP3 player is mounted on a car audio system, and the car audio system has an insertion part formed on the front surface of a car audio case for allowing a user to insert a semiconductor chip storing compressed audio data therein. Referring to FIG. 1, the prior art will be described in more detail.

FIG. 1 is a briefly structural view of a conventional MP3 player for a car. A sub microprocessor 6 reads compressed information from the semiconductor chip 5 inserted into the insertion part (not shown) formed on the front surface of the car audio case. The sub microprocessor 6 transmits the information data to a decoder 8 according to a control of a main microprocessor 7 in order to restore the compressed audio data. A digital/analog converter 9 receives a digital audio data from the decoder 8, and converts it into an analog audio signal. An equalizer 10 selectively inputs the audio signal inputted from the digital/analog converter 9 or an audio signal inputted from the external audio device in order

to improve a frequency feature of the signal.

A stereo IC 13 outputs a stereo audio signal corresponding to the frequency feature of the signal and the audio signal with improved volume outputted from the equalizer 10. The stereo audio signal outputted from the stereo IC 13 outputs music through a switch IC 20 for selectively outputting music to a front stereo, a rear stereo and a sub low-sound outputting terminal 14, 15 and 16. Meanwhile, a spectrum analyzer 17 receiving each frequency feature of the signal outputted from the equalizer 10 analyzes the frequency feature and outputs data for displaying it in a graph. The main processor 7 controls the sub microprocessor 6 and the equalizer 10 according to the data received from the spectrum analyzer 17 and a user's selection inputted through a key input part, and displays operation information through an LCD display part 3.

The prior art restores information of the semiconductor chip compressibly storing the audio data therein and provides the user with music by outputting the audio signal through each output terminal.

However, the prior art needs the semiconductor chip compressibly storing the audio data therein and a device for reading and restoring the audio data and processing the audio data into the audio signal in order to provide the user with music. That is, such systems must be additionally equipped in the car audio system.

As another prior art, there is a cassette tape type MP3 player for providing music using a cassette player equipped in the car audio system. That is, the cassette tape type MP3 player for compressibly storing and restoring the audio data in an MP3 type and playing music can be inserted into the cassette player.

To listen to MP3 music, when the driver inserts the MP3 player into a tape slot of the cassette player, the cassette player is actuated, and audio data outputted from the MP3 player is read through a cassette player head.

Such MP3 player has an advantage in that the user can listen to music anywhere if he or she has a cassette player. However, the MP3 player has a disadvantage in that it is difficult to produce the natural sound quality of MP3 sound since the MP3 sound is transmitted through the cassette player head. Furthermore, if the user wants to turn on a radio receiver or a CD player, the MP3 player must be removed from a cassette deck. After that, to reuse the MP3 player, the user has to insert the MP3 player again. In addition, the MP3 player may be sprung out of the cassette deck of the car audio system of itself while the user listens to music after inserting the MP3 player into the cassette deck of the car audio system, and may

be out of order in case where the cassette deck is a logic deck for electronically inserting a cassette tape into and removing it from the cassette deck. By the above problems, the MP3 player may cause a traffic accident since it prevents the driver's driving.

Technical Solution of the Invention

Accordingly, it is an object of the present invention to provide a wireless audio transmitter for an MP3 player, which frequency-modulates an audio signal outputted from the MP3 player, transmits the modulated audio signal to a tuner through an antenna mounted on a car audio system, and audibly outputs the audio signal through a speaker to the air, thereby allowing a user to conveniently listen to high quality MP3 sound during driving.

Constitution and Operation of the Invention

To achieve the above object, according to the present invention, there is provided a wireless audio transmitter for an MP3 player, which transmits an audio signal from the portable MP3 player to a car audio system, including: a frequency selector for selecting a frequency in order to transmit the audio signal outputted from the portable MP3 player to a tuner of the car audio system; an FM high frequency converter for converting the audio signal outputted from the portable MP3 player into FM signal and conveying the FM signal to a high frequency in order to wirelessly send the FM signal to a channel selected by the frequency selector; an RF amplifier for amplifying the FM high frequency signal transmitted from the FM high frequency converter to a predetermined level for wireless transmission; a band-pass filter for extracting only electric waves of a frequency band necessary for the high frequency signal outputted from the RF amplifier and sending the extracted electric waves to the earphone wire; a frequency counter for counting frequency from the signal outputted from the FM high frequency converter during a predetermined time period; an LCD driver for generating LCD driving data in order to indicate the frequency counted by the frequency counter as digital numbers on an LCD device; and a voltage regulator for uniformly maintaining power source supplied from the car in order to supply the power source to each part of the transmitter.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. 2 is a view showing the outward appearances of a wireless audio transmitter of an MP3 player according to the present invention and a car audio system. The present invention includes a portable MP3 player 100, a wireless audio transmitter 200 for frequency modulation (hereinafter, called "FM") and wireless transmission of an audio signal outputted from the portable MP3 player, an earphone jack 202 for transmitting sound of the portable MP3 player 100, an earphone wire 204 having an antenna needle therein for transmitting the

audio signal outputted through the earphone jack 202 to the wireless audio transmitter 200 and sending an outputted high-frequency signal to the air, an MP3 player holder 201 mounted at a predetermined place inside a car for allowing the portable MP3 player 100 to be easily mounted in the car, and a car audio system 240 having a radio receiver, an antenna 301, a cassette player and a compact disk player (CDP) and installed at a predetermined place of the front surface inside the car.

Now, referring to FIG. 3, the wireless audio transmitter 200 will be described hereinafter.

The wireless audio transmitter 200 includes: a frequency selector 211 for selecting a frequency in order to transmit the audio signal outputted from the portable MP3 player 100 to a tuner of the car audio system 300; an FM high frequency converter 210 for converting the audio signal outputted from the portable MP3 player 100 into an FM frequency and conveying the FM signal to a high frequency in order to wirelessly send the FM signal to a channel selected by the frequency selector 211; an RF amplifier 212 for amplifying the FM high frequency signal transmitted from the FM high frequency converter 210 to a predetermined level for wireless transmission; a band-pass filter 214 for extracting only electric waves of frequency band necessary for the high frequency signal outputted from the RF amplifier 212 and sending the extracted electric waves to the earphone wire 202; a frequency counter 216 for counting frequency from the signal outputted from the FM high frequency converter 210 during a predetermined time period; an LCD driver 218 for generating LCD driving data in order to indicate the frequency counted by the frequency counter 216 on an LCD device 220 into digital numbers; and a voltage regulator 222 for uniformly maintaining power source supplied from the car in order to supply the power source to each part of the transmitter.

Referring to FIGS. 2 and 3, the operation of the present invention will be described in more detail as follows.

First, the MP3 player holder 201 according to the present invention is mounted at a predetermined place of the front surface of the car for allowing a user to easily manipulate the portable MP3 player 100. Next, a power cable 224 provided to the MP3 player holder 201 is connected to a power terminal provided to the car audio system 300 so as to supply electric power to the wireless audio transmitter 200.

Here, since an end of the power cable 224 connected to the MP3 player holder 201 can be inserted into a power supply slot (not shown) of a cigar plug of the car, electric power can be conveniently supplied to the wireless audio transmitter 200 through the cigar plug of the car.

At this time, the supplied electric power is provided to a power supply terminal (ground)

(Power + 12V) of the wireless audio transmitter 200.

The portable MP3 player 100 is seated on the MP3 player holder 201, and the earphone jack 202 provided to a side of the wireless audio transmitter 200 is inserted into an earphone slot (not shown) of the portable MP3 player 100.

To listen to MP3 sound through a speaker (SPK) provided in the car by playing music stored in the portable MP3 player 100 mounted in the car as described above, first, the user selects a frequency to be sent to the tuner of the car audio system using the frequency selector 211.

After that, when the user selects a play button of the MP3 player 100, MP3 audio data compressibly stored in the portable MP3 player 100 is restored, and transmitted to the wireless audio transmitter 200 through the earphone jack 202 and the earphone wire 204.

Since the wireless audio transmitter 200 cannot receive the audio signal outputted from the portable MP3 player 100 through the FM radio receiver of a general car audio system, the audio signal is converted into an FM high frequency signal. That is, the stereo audio signal outputted from the portable MP3 player 100 is converted into the stereo FM high frequency signal using a phase locked loop (PLL) system.

To this end, the FM high frequency converter 210 modulates the audio signal into the FM signal, and conveys the modulated FM signal to the high frequency signal for wireless transmission.

Meanwhile, the frequency counter 216 counts the number of waves generated from the FM high frequency converter 210 as an electric signal during a selected time period, and the frequency selector 211 detects the FM frequency selected by the user.

The LCD driver 218 generates actuating data for displaying the counted frequency on the LCD device 220 into digital numbers.

The frequency now selected by the user is displayed on the LCD device 220 into numbers by the actuating data of the LCD driver 218.

Meanwhile, the high frequency signal modulated by the wireless audio transmitter 200 is an RF (Radio Frequency) signal, and is amplified into the RF signal of a predetermined level so as to be wirelessly sent to the air within a predetermined range.

The RF signal amplified by the RF amplifier 212 is sent to the air through the earphone wire

204 embedding the antenna needle therein by extracting only electric waves of necessary frequency band out of a plurality of mixed band waves from the band-pass filter 214.

Usable wireless FM frequency band range in Korea is 88.0MHz~89.2MHz, and is divided into 7 stage channels at an interval of 200 KHz.

Meanwhile, to listen to MP3 sound through the radio receiver equipped in the car audio system 300, the user turns on the radio receiver, performs a frequency tuning using a frequency selection button, and fixes the selection button on the FM frequency selected by the user. The frequency selected by the user is also displayed on a car audio display window in the same way as the frequency displayed on the LCD device 220 of the wireless audio transmitter 200.

As described above, when the frequency of the radio receiver of the car audio system tuned by the user is equal to the frequency transmitted from the wireless audio transmitter 200, the FM frequency transmitted through the earphone wire 202 is inputted to the radio receiver through the car antenna 301.

The audio signal inputted through the radio receiver is outputted through the speaker of the car audio system through the same process as the case where the user listens to the general car radio.

Effect of the Invention

As described above, the wireless audio transmitter for the MP3 player according to the present invention allows the user to conveniently listen to high quality MP3 sound as good as the user listens to the radio using the portable MP3 player since the audio signal outputted from the portable MP3 player is transmitted to the radio receiver of the car audio system and outputted through the speaker to the air. Moreover, the present invention removes inconvenience in connection of complicated audio cables and factors of obstructing the driver's driving since the audio signal is transmitted wirelessly. Additionally, the present invention can output sound through the radio receiver anytime without regard to any external sound source apparatus when the user inserts the earphone jack 202 to one of various external sound source apparatuses, such as an MP3 player, a CD player and others.

CLAIMS

1. A wireless audio transmitter for an MP3 player, which transmits an audio signal from the portable MP3 player to a car audio system, comprising:

a frequency selector for selecting a frequency in order to transmit the audio signal outputted from the portable MP3 player to a tuner of the car audio system;

an FM high frequency converter for converting the audio signal outputted from the portable MP3 player into an FM signal and conveying the FM signal to a high frequency in order to wirelessly send the FM signal to a channel selected by the frequency selector;

an RF amplifier for amplifying the FM high frequency signal transmitted from the FM high frequency converter to a predetermined level for wireless transmission;

a band-pass filter for extracting only electric waves of a frequency band necessary for the high frequency signal outputted from the RF amplifier and sending the extracted electric waves to the earphone wire;

a frequency counter for counting frequency from the signal outputted from the FM high frequency converter during a predetermined time period;

an LCD driver for generating LCD-driving data in order to indicate the frequency counted by the frequency counter as digital numbers on an LCD device; and

a voltage regulator for uniformly maintaining power source supplied from the car in order to supply the power source to each part of the transmitter.

2. The wireless audio transmitter for an MP3 player according to claim 1, wherein the antenna includes an antenna needle embedded in an earphone wire in order to send the high frequency signal transmitted from the band-pass filter to the air.

3. The wireless audio transmitter for an MP3 player according to claim 1, wherein the electric power is supplied to the voltage regulator through selective connection of a cigar plug of a car or a power supply of the car audio system.

FIGURES

FIG. 1

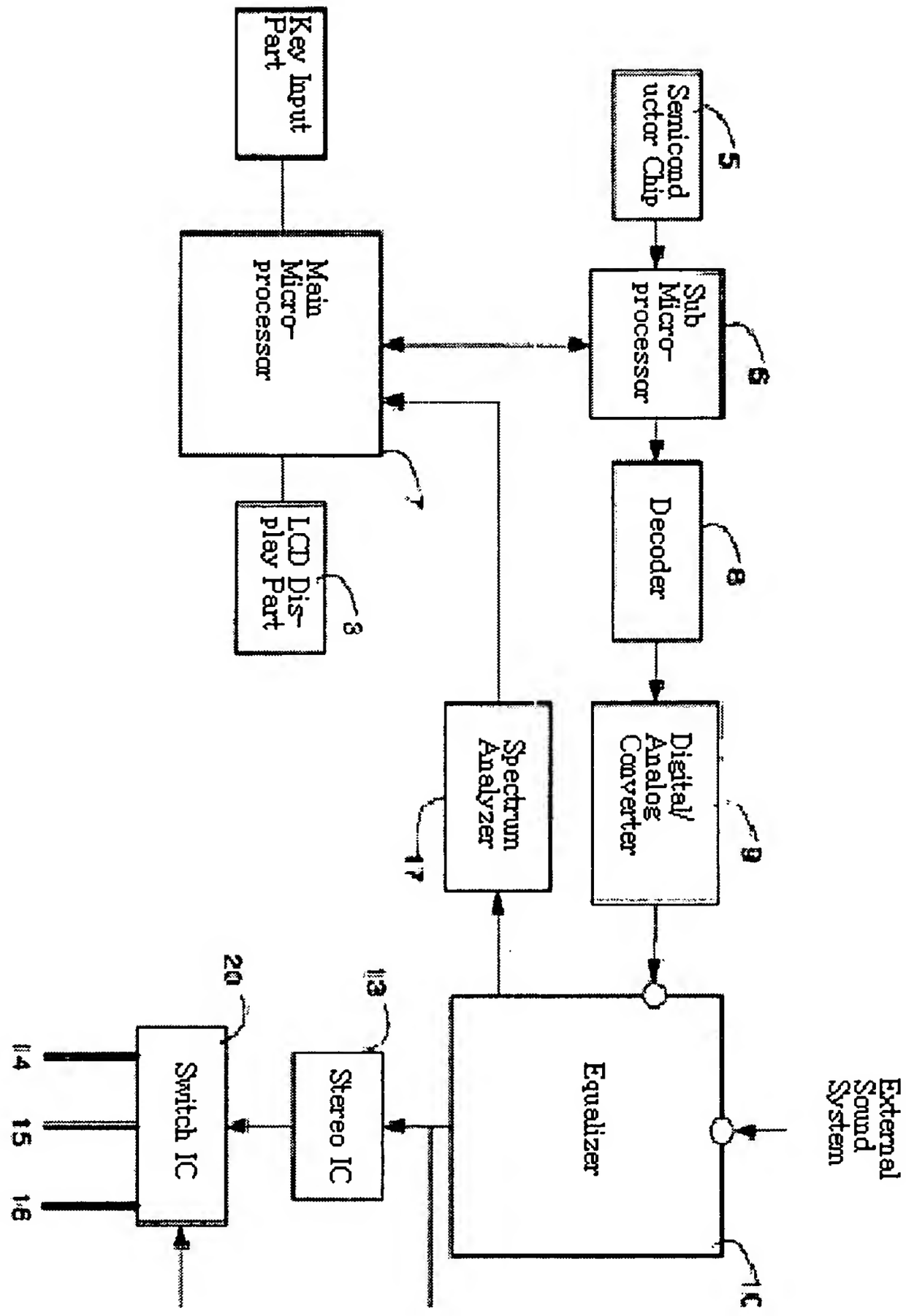


FIG. 2

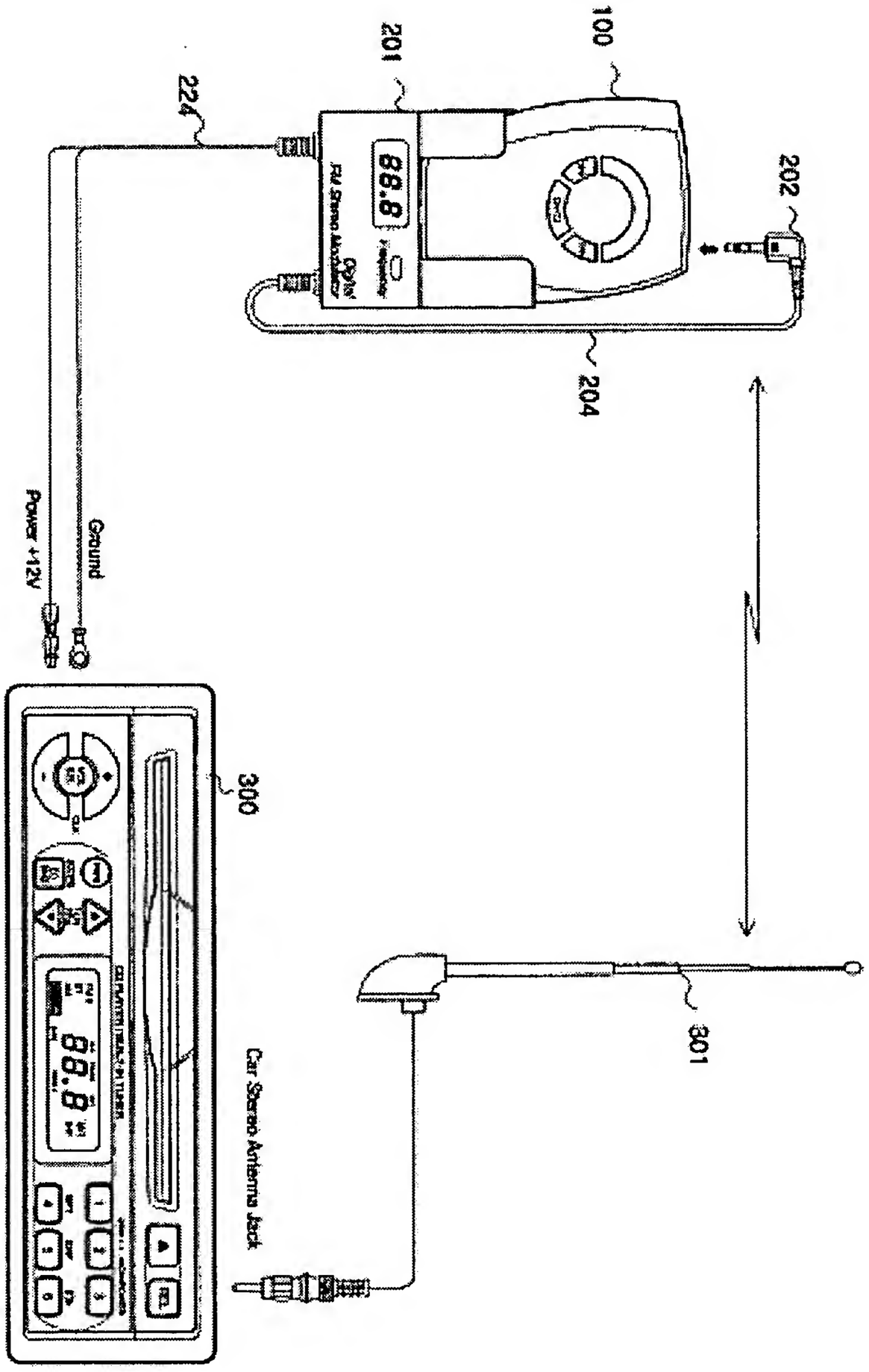
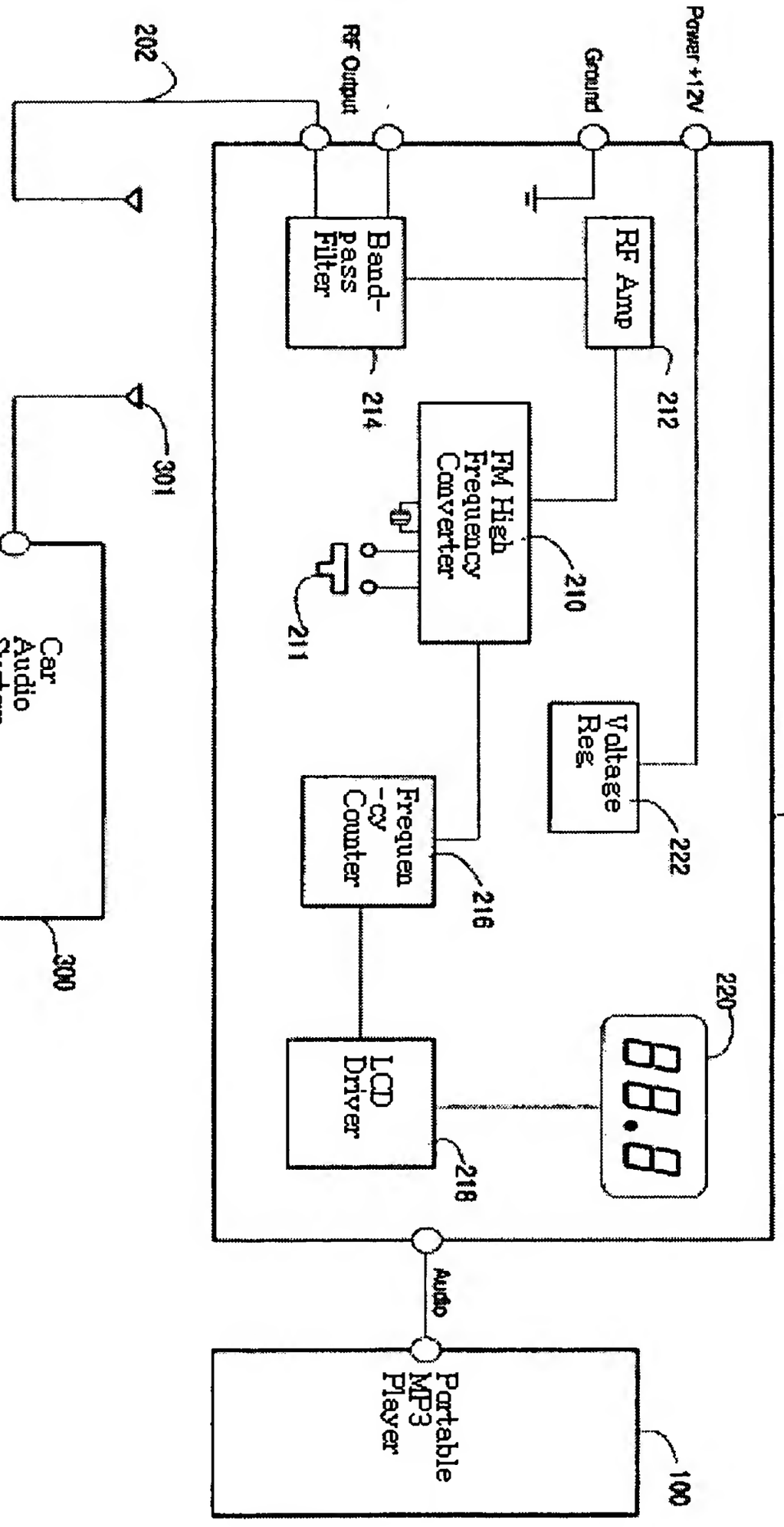

100
101
202
224
204
Power +12V
Ground
300
301
Car Stereo Antenna Jack

FIG. 3


202
RF Output
Ground
Power +12V
Band-pass Filter
RF Amp
214
212
FM High Frequency Comverter
210
211
Voltage Reg.
222
200
Frequen-cy Counter
216
220
88.8
LCD Driver
218
Audio
Car Audio System
301
300
Portable MP3 Player
100